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Sarcomas of the Soft Tissues

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Introduction

The term soft tissues might be interpreted as applying to all of the tissues except the bones. Actually, however, it is customary to exclude from it all organs and mucosa-lined canals, all lymphoid tissues, all epithelial structures of the skin, and the ganglia and paraganglionic tissues of the peripheral nervous system. This leaves for consideration the soft tissues which clothe the body surface and fill in the interstices of the retroperitoneum, mediastinum and orbits. It should also include the mesothelial elements of the pleura, pericardium and peritoneum, but these will be arbitrarily excluded in this article. The soft tissues, therefore, are the connective tissues and fat, the blood and lymphatic vessels, the smooth and striated muscles, the synovial tissues and the histiocytes, all of which are derived from the primitive mesenchyme. Because the peripheral nerves are everywhere intermingled with the structures already enumerated, they will be included in spite of the fact that their principal cell is derived from neurectoderm and not from mesenchyme.

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The tumors which form in these tissues are many and varied. Most of them are benign: fibroma, lipoma, hemangioma and lymphangioma, leiomyoma and sometimes tumors compounded of more than one element such as the glomus tumor, the xanthogranuloma and the benign mixed mesenchymal tumor or mesenchymoma. There are also the benign tumors of Schwann cells from the peripheral nerves called neurofibromas and neurilemomas and there are still other tumors, the exact composition of which remains in dispute, such as the tumor commonly called the granular cell myoblastoma. Since this article will deal with the malignant tumors derived from the various tissues enumerated above, it will be impossible to discuss the many interesting features of these benign tumors except insofar as they can be regarded as precancerous and as they must be considered in differential diagnosis.

The malignant tumors of the soft tissues are generally classified as sarcomas. The word sarcoma is derived from the Greek and means fleshy tumor. While this is descriptive of some of these malignant tumors, not all are fleshy: Some are quite fibrous; others,

markedly vascular and, if they contain bone or cartilage, they may be stony hard. Therefore, in more recent times the term has acquired a secondary significance and is applied chiefly to the malignant tumors derived from the mesenchyme. While the word sarcoma connotes a malignant tumor it is impossible to make many sweeping informative statements about the disease because there are some 21 varieties of sarcomas of the soft tissues, each with distinguishing characteristics of histology and biological behavior, with varying tendencies to infiltrate locally, metastasize through the blood and lymphatic vessels, and in other ways. Usually when it is also realized that soft tissue sarcomas are so rare that the average surgeon working in a general hospital may only encounter one or two of them in a year and may never see one of the rarer varieties in a lifetime, it can scarcely be surprising that information is very scanty and hard to compile. The infrequency of these tumors may be judged from Dorn and Cutler's report on morbidity from cancer in the United States. Among 35,812 cancers reported in 10 cities in the United States, soft tissue sarcomas numbered 297 and peripheral nervous system malignant tumors 123, making a total of 420 (1.2%). Bone sarcomas totaled only 181 (0.51%).

Usually one cannot with certainty diagnose a swelling in the soft tissues of the body from physical signs alone, even when aided by X ray and many other clinical laboratory investigations. The only way to be certain is by biopsy. Rarely, even this can mislead, but not if the pathologist is skilled and experienced. Although this fact has been repeatedly demonstrated during the past half century, physicians often ignore the biopsy and manage this problem of diagnosis and treatment in much the same fashion as did their professional forefathers.

A swelling in the soft tissues may be a primary or secondary malignant tumor, a benign tumor, or it may be a nonneoplastic lesion such as hematoma, aneurysm, myositis ossificans, or some other one of the dozens of causes of such swellings. If the tumor is a local primary sarcoma, the one possibility of saving the victim's life lies in removing all of its local growth before distant metastasis occurs. Since these malignant sarcomas regularly infiltrate the surrounding tissues far beyond their palpable confines, and also because any extensive "hashing up" of the tumor is believed to facilitate metastatic spread, obviously the best treatment calls for a cautious biopsy in a bloodless field and, depending on the diagnosis, a sufficiently radical operation to remove all of the tumor with a wide zone of uninvolved tissue about it together with the biopsy wound.

But what do some surgeons do? They explore the swelling, exposing it widely, thus cutting into the peripheral zone of spread; they then proceed to excise the lesion, either piecemeal or in one mass, close to its periphery. Inevitably this leaves tumor cells behind which have been stirred up and freed from their attachments. Although secondary radical excision or amputation may be done, metastasis is all too apt to occur in the interim and the result is frequently death from recurrent and metastatic sarcoma.

Most unfortunately for the victims, the vast majority of these malignant sarcomas are painless and do not interfere with function in their early stages. Thus, the average individual pays no attention to the swelling even after he becomes aware of it. He waits until it bothers him. By the time he reaches the surgeon his tumor may already be in-

curable because of distant metastases. There does not seem to be anything to do about this because the sarcomas are so rare that specific public propaganda would not be justified. But this is no reason for failing to apply the principles of cancer surgery in diagnosis and treatment when definitive therapy is finally undertaken. It is still possible to cure some of these unfortunates even when the sarcoma is large and long standing.

In the following pages an attempt will be made to give some information concerning the more frequent varieties of these tumors and their behavior.

Etiological Factors

Extremely little is known about processes which are antecedent to the development of soft tissue sarcomas. It is certain that very few of them develop from their benign prototypes. One need not fear that a liposarcoma will develop from a lipoma, an angiosarcoma from an angioma or a malignant schwannoma from a neurilemoma. Fibrosarcomas very occasionally develop in scar tissue, including the scars of excessive irradiation, but when one realizes that probably no individual goes through life unscarred, the coincidence is extremely small. When a deep-seated fibrosarcoma or angiosarcoma develops following a contusing blow it must not be assumed that the tumor developed as a result of the blow. Quite possibly the blow simply traumatized an occult pre-existing tumor and accelerated its growth. On the other hand, malignant tumors of peripheral nerves, in about half of recorded cases, develop in nerves whose Schwannian cells have proliferated as part of the peculiar generalized process known as von Recklinghausen's disease.

It is possible to induce the development of many of these sarcomas in the soft tissues of rats and mice by the insertion of various polymers in the form of plastic films. No sarcomas have as yet been recorded in humans in connection with burying similar plastics. Whether or not they will prove cancerigenic in human beings is unknown. In the rodents, the sarcomas do not develop until the plastics have resided in their tissues for one half or more of the animal's expected lifetime. No plastic is known to have been buried in a human for a comparable portion of his lifespan. It can be said, however, that rodents develop tumors with far greater ease than do human beings and it is to be hoped that these extremely useful plastics will not prove to be cancerigenic for humans.

Age and Sex

It seems important to stress only the fact that these sarcomas can develop at any age and that neither sex is exempted from them. Proportionately children are somewhat more apt to develop sarcomas of the soft tissues than are adults. Handy and Goldberg found that in New York State, exclusive of New York City, for the 1949-1951 period, sarcomas of the soft tissues among children under 15 years of age formed 3.7 per cent of all tumors with an average annual rate of 0.4 per 100,000 and stood sixth in order of frequency. The fibrous forms are more common than the others in children. Liposarcomas are more common in the later years of life, but any form may first manifest itself at any age.

Fibromatoses and Fibrosarcoma

There is such a great deal of confusion and misunderstanding about growths composed of fibrous tissue that certain facts concerning them must be appreciated before they can be presented to the reader. The names con-

note benign and malignant tumors composed of fibroblasts and the connective tissue fibers formed by them. Because of the fact that cells of many different sorts can function as fibroblasts, it is essential that the terms be applied only to those tumors whose cells are primary fibroblasts and produce only connective tissue fibers and not other tissues as well. It requires experience for a pathologist to recognize this. A second important consideration is to realize that the biological course of a tumor is not always easily predictable from its histological appearance. A growth that is so well differentiated that it resembles scar tissue may exhibit stubborn, aggressive, infiltrative growth, progressively invading surrounding tissues in such a fashion as to cause the loss of an extremity or even of the victim's life if unchecked. Such growths can occur in both children and adults. They are quite unpredictable. Growth may be continuously progressive as described or may cease for periods up to 30 years, only then to resume activity. After such periods of inactivity, the tumor usually maintains the differentiation it had in the beginning. Such growths, if they remain well-differentiated, can metastasize by embolism but do so only with extreme infrequency, probably in not more than 0.5 per cent of cases. One must consider the possibility of metastasis if the tumor shows mitoses. These tumors are classified as fibromatoses (Table 1-A).

Table 1-A

194 Fibromatoses of the Soft Tissues*

Retroperitoneum	
Mesentery and Omentum	8
Mediastinum	0
Orbit	0
Head and Neck	45
Trunk	46
Upper Extremity	65
Lower Extremity (Thigh 14)	30

Juveniles 0 to 15 years of age—81

The term fibrosarcoma is generally applied to the more cellular fibroblastic tumors in which the cells are somewhat more anaplastic. But such growths are extremely difficult to distinguish from fibromatoses if many fibers are formed and no mitoses are discovered. The best known example of this variety is the so-called *dermatofibrosarcoma protuberans*. This tumor develops in the corium and usually produces a growth composed of multiple, confluent, hard nodules elevating the epidermis, which often has a reddish hue. Like the fibromatoses these tumors exhibit slow invasive growth, and metastases are exceedingly rare. Similar well-differentiated fibrosarcomas have also been found deeper in the extremities, attached to the periosteum, and in the mesentery. Obviously, there is no clinical difference between the fibromatoses and differentiated fibrosarcomas (Table 1-B).

If one excludes the invasive fibromatoses and the well-differentiated fibrosarcomas, the truly malignant fibrosarcomas are relatively fewer in number. They are not difficult to recognize histologically as potential metastatic sources because of the anaplasia of the cells and the frequence of mitoses. It is not so easy for the pathologist to distinguish them from some of the other malignant sarcomas and, because of this the name, fibrosarcoma is wrongly applied to many sarcomas of other types,

Table 1-B

268 Differentiated Fibrosarcomas

Retroperitoneum	
Mesentery and Omentum	7
Mediastinum	2
Orbit	0
Head and Neck	32
Trunk	118
Upper Extremity	62
Lower Extremity (Thigh 17)	47

notably the liposarcoma, the leiomyosarcoma, the rhabdomyosarcoma, and occasionally other varieties. The malignant fibrosarcomas are almost always situated in the subcutaneous tissues or more deeply among the muscles and fasciae. They infiltrate insidiously and painlessly, causing no interference with function. The deeper ones therefore are very apt to be neglected both by the patient and the physician who first examines him. When finally investigated and a diagnosis is made, the local lesion may only be curable by a drastic surgical operation. However, what is worse is that metastasis through the blood stream frequently has already lodged tumor emboli in the lungs rendering the case incurable. The malignant fibrosarcomas may be found anywhere but they are most common in the thigh and the rest of the lower extremity. They are less common in the upper extremity, trunk, head and neck and are least common in the retroperitoneum, mediastinum and orbit (Table 1-C).

Table 1-C
171 Malignant Undifferentiated Fibrosarcomas

Retroperitoneum	
Mesentery and Omentum	2
Mediastinum	2
Orbit	1
Head and Neck	9
Trunk	37
Upper Extremity	26
Lower Extremity (Thigh 52)	94

No doubt, the reader has found the above description of fibrous tumors confusing in the extreme. This seems impossible to avoid because of the great variability of clinical behavior which is impossible to predict with complete accuracy. All that one can do is to give a statistical estimate of probable behavior from histological study of biopsy sections. If the tumor is deeply seated in an extremity, especially in the thigh and is anaplastic with many mitoses, the chances of blood-borne metastatic spread are great and the chances of lymphatic spread are slight. Whether or not the tumor feels circumscribed, it is always locally invasive well beyond its palpable limits. Even the most drastic surgical treatment will result in few cures. Such tumors are rare in children—most of them are found in adults of all ages. If on the other hand, the tumor is in the skin or, if deeper, is well-differentiated and without mitoses, infiltrative growth can be counted upon but the chances that the tumor will metastasize are extremely slight. Tumors of this sort, if widely excised well beyond the palpable borders without entering the tumor field at any point, can be cured on the first attempt. The more frequent the recurrences after inadequate operation, the greater the danger of uncontrollable infiltrative growth, deformity, loss of function and even loss of life.

Myxoma

The myxoma is an uncommon growth composed of tissue strongly resembling undifferentiated embryonal mesenchyme. It can occur at any age and in either sex. The majority are found in older individuals. Myxomas may appear in the soft tissues anywhere from the corium down to the periosteum but they are very rare in the retroperitoneum, mediastinum and orbit (Table 2). They seldom attain a large size; the largest ever recorded weighed just under five and a half kilos. The pure myxoma is composed of widely-spaced, small, stellate and spindle-shaped cells with the intervening spaces filled with hyaluronic acid, which is a slimy mucopolysaccharide, and a delicate supporting framework of very slender reticulin fibers. There are relatively few

Table 2
117 Myxomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	6
Mediastinum	0
Orbit	4
Head and Neck	23
Trunk	24
Upper Extremity	25
Lower Extremity (Thigh 20)	35

capillaries. Variation can occur if the tumor is partly fibrosed. The myxoma can be imitated by two benign lesions —the ganglions of tendons and their sheaths, joint capsules and the skin of finger tips, and the localized myxedematous lesions found occasionally in cases of hypothyroidism following severe hyperthyroidism. A much more important problem of differential diagnosis is the separation of the pure myxoma from malignant tumors with myxoid areas such as the liposarcoma, rhabdomyosarcoma, leiomyosarcoma, synovial sarcoma and malignant mesenchymoma. This is a matter for the pathologist. The distinction is important because the pure myxoma does not metastasize, at least in this writer's experience, while all of the other tumors mentioned may kill either by metastasis through the blood stream or by direct invasion. The reason for including the pure myxoma among the malignant tumors of the soft tissues lies in the fact that it is a tumor which infiltrates insidiously and consequently has a high recurrence rate unless removed widely by block dissection. As far as my knowledge goes, I know of no case cured by roentgenotherapy.

Liposarcoma

Although it is not generally appreciated, the liposarcoma is the most common of all malignant tumors of the soft tissues. It is also one of the most spectacular because of the large size which it may attain. Many tumors weighing more than a kilo have been described. The largest recorded case weighed 32 kilos. It is a tumor which is seldom found in children but occurs with increasing frequency as age advances, the mean being about 53 years. There is little difference in incidence between the sexes; if anything, it is slightly more frequent in males. It may develop in any of the soft tissues but it is most frequently observed in the lower extremity, especially in the thigh and the adjacent popliteal space, inguinal and gluteal regions and in the retroperitoneum, particularly in the perirenal tissues (Table 3). While generally soli-

Table 3
436 Liposarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	70
Mediastinum	5
Orbit	2
Head and Neck	29
Trunk	65
Upper Extremity	49
Lower Extremity (Thigh 164)	216

tary, there may be multiple tumors which can appear successively instead of simultaneously. It is interesting that in spite of the high frequency of simple lipomas, the number of liposarcomas developing in them is negligible. It is even very uncommon for a person with multiple lipomas to develop a liposarcoma. The etiological factors governing the development of liposarcomas are not known. It does not seem to have any significant relationship to obesity, lipomatosis, radiation or other cicatrizing damage. The sarcoma-producing carcinogens in rodents very seldom initiate the growth of liposarcomas.

Liposarcomas can be divided into two groups just as in the case of fibrosarcomas; there are the well-differen-

tiated myxoid tumors and the poorly differentiated tumors which are sometimes slimy. The better differentiated tumors generally have the usual aspect of benign lipomas but they differ because they exhibit varying degrees of sliminess. The yellow color of the fat is still detectable although it may be spotty.

The poorly differentiated tumors do not have the appearance of lipomas, although they may be tinged with yellow in places. Most of the tumor is a solid pinkish-gray. Sliminess is often absent. The histological aspect of these tumors usually reproduces the appearance of embryonal lipoblastic tissue, or resembles brown fat which lacks myxoid elements, or it may be composed of a mixture of both kinds. As in so many other malignant sarcomas, there can be an associated fibrous proliferation and even sometimes osseous metaplasia.

Growth of these tumors proceeds at variable rates of speed; sometimes it is so rapid that they attain a large size in a few months. Whether they are well or poorly differentiated, all of them grow by infiltration at the periphery, although increase in bulk is probably also aided by expansile tumor cell growth as well. One must not be deceived by what seems to be encapsulation; an attempt to "shell the tumor out" leaving capsule behind or an excision very close to the tumor margin invariably fails to remove all of it and local recurrence is assured.

Curative treatment is wide surgical removal. Depending upon the location, size and relations of the tumor, this may be quite feasible without much sacrifice of normal tissues or it may mean a very drastic procedure such as hind- or forequarter amputation. The well-differentiated tumors seldom metastasize and the poorly-differentiated ones have a metastatic rate in the vicinity of 40 per cent. Thus, it is of great value to find out the nature and degree of differentiation of the liposarcoma by biopsy before undertaking definitive treatment. The liposarcoma is somewhat radiosensitive and small superficial nodules have been destroyed by massive tumor doses. No large tumor has ever been cured by irradiation.

Malignant Myogenic Tumors

There are two sure and one possible variety of malignant tumors featuring muscle cells. The first is composed of smooth muscle cells and is quite properly designated as leiomyosarcoma. A second variety features cells with the characteristics of the striated muscle cell. The third variety is of uncertain derivation. Originally it was assumed that its granular cells were derived from myoblasts but this origin has been questioned by many and its exact cellular components remain a mystery. It is included here because it is probably best known as a malignant organoid granular cell myoblastoma.

LEIOMYOSARCOMA

One usually thinks of malignant smooth muscle tumors in connection with the uterus and the gastrointestinal tract, and with justice, for these are the locations of a majority of them. Nevertheless, they can be found in other tissues, especially in the retroperitoneum. Table 4 shows the distribu-

Table 4

105 Leiomyosarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	61
Mediastinum	1
Orbit	2
Oral Cavity	5
Rest of Head and Neck	6
Trunk	9
Upper Extremity	3
Lower Extremity (Thigh 14)	18

tion of 105 cases recorded in the Laboratory of Surgical Pathology of Columbia University. There is no important sex preponderance and a large majority of the tumors are encountered in adults. Although occasionally a leiomyosarcoma arises in the skin, by far the greatest number are deep to the skin. Almost all of the smooth muscle tumors of the skin are benign leiomyomas. Many benign smooth muscle tumors are quite vascular and it is assumed that they arise from the smooth muscle of venules or arterioles. This may be the origin of the leiomyosarcomas but it is an unproved assumption. Two of our cases arose from large veins, one in the mediastinum from the vena azygos and one in the thigh from the femoral vein. There are no known etiological factors to account for the origin of the soft tissue leiomyosarcomas.

Leiomyosarcomas usually are not difficult to recognize in microscopic sections. Many are well enough differentiated so that myofibrils are formed. Such tumors must be segregated from the leiomyomas. If there are an appreciable number of mitoses, the diagnosis of malignancy can be made with assurance. If there are mitoses but no myofibrils the tumor must be distinguished from fibrosarcoma and malignant schwannoma. For the experienced pathologist, this is not difficult.

Clinically these are firm tumors, usually subcutaneous or deeper, which grow at variable rates of speed and tend to feel circumscribed although actually they infiltrate surrounding tissues. Metastasis is almost always through the blood stream and occurs in at least 50 per cent of the cases. It would seem that there is a somewhat better chance of curing a leiomyosarcoma by wide excision of tissues than is the case with many of the other soft tissue sarcomas. Perhaps this is because local infiltrative growth is not as insidious and widespread and in some cases metastasis may not have already taken place by the time the patient reaches the surgeon. Unfortunately, a majority of these tumors are found in the retroperitoneum where they have already attained a large size before their presence is suspected and complete excision, because of their situation, is impossible. Radiotherapy has sometimes reduced the size of a leiomyosarcoma of the soft tissues but no cures have been recorded.

Rhabdomyosarcoma

The malignant tumors composed of rhabdomyoblasts—cells which normally form voluntary or striated muscle cells and fibers, are quite varied although all of them are uncommon. There are two varieties found chiefly in infants and small children. A special form of these is found in the male and female pelvic organs. The tumor grows to the surface of the vagina, bladder or perineum as protruding semitranslucent grape-like nodules. This variety is known as sarcoma botryoides and does not concern the soft parts primarily. It must be mentioned, however, because very occasionally it can appear in the retroperitoneal and orbital areas. Botryoid sarcoma very seldom metastasizes through the blood stream but kills because of unchecked infiltrative growth. Another variety, characterized by small rounded cells with occasional cytoplasmic differentiation and even sometimes cross striations, occurs in children, especially in the head and neck zones, but also occasionally in other parts of the body (Table 5). This juvenile, or infantile rhabdomyosarcoma, as it is called, metastasizes more frequently through the blood stream than does the botryoid sarcoma. These two varieties are very rarely seen in adults.

Table 5

Rhabdomyosarcoma of Soft Tissues*
Location of 181 Adult and Juvenile Tumors

Location	Adult	Juvenile	Total
Retroperitoneum	9	3	12
Mediastinum	5	0	5
Auricle and Middle Ear	0	4	4
Orbit	0	19	19
Head and Neck	9	7	16
Trunk	39	5	44
Upper Extremity	16	1	17
Lower Extremity	54	10	64
(Thigh, Adult 33)			
(Thigh, Juvenile 5)			

**Exclusive of rhabdomyosarcomas of organs, of teratomas, of mixed tumors and mesenchymomas in which there is a rhabdomyosarcomatous element.*

The usual variety of pure rhabdomyosarcoma found in adults generally starts in the vicinity of some voluntary muscle and grows rather rapidly. If unchecked by any treatment or if cut into but not completely removed, it is very apt to fungate outward through the skin. This variety is usually characterized by the formation of giant rhabdomyoblasts with multiple nuclei and, even if they remain without the formation of myofibrils or cross striations, they are apt to have vacuoles containing glycogen. There is no sex preponderance or age variation except that this type hardly ever is found in children. It is a very malignant form of sarcoma which metastasizes regularly through the blood stream. It also may spread through lymphatics to regional lymph nodes more frequently than the majority of other malignant tumors of the soft tissues do. The adult type of rhabdomyosarcoma is found most frequently in the muscles of the lower extremity, especially the thigh and in the trunk and retroperitoneum.

There is no sure way of diagnosing rhabdomyosarcoma except by histologic examination. Since it is a very malignant tumor form with a high metastatic rate, it is essential to assure the complete removal of the local lesion by drastic surgery once the diagnosis is firmly established. Radiotherapy does not seem to be an effective form of treatment. It may be justifiable also to consider resection of regional lymph nodes. Unfortunately, the opportunity to effect a cure seldom occurs because most of the cases have already metastasized before the surgeon ever sees the patient.

Malignant Granular Cell Tumors

Since these tumors are found chiefly in the voluntary muscles of the body and are presumed by some to originate from rhabdomyoblasts, it seems best to introduce them at this point although their actual cellular origin is unknown and it has been assumed by many pathologists that they arise from nonchromaffin paraganglionic cells. It is unnecessary to enter into a discussion of this controversy, but it is important to stress the fact that the vast majority of granular cell myoblastomas of nonorganoid aspect are benign. The writer has only encountered five which were malignant and metastasized. On the other hand, the organoid granular cell tumors are very definitely malignant

and metastasize through the blood stream in a large percentage of cases.

MALIGNANT ORGANOID GRANULAR CELL MYOBLASTOMAS—These are tumors especially, but not exclusively, of adolescents and young adults, without any sex preponderance. They are deeply situated, chiefly in the extremities, and most of them are in relationship with striated muscles (Table 6). Like so many sarcomas of the soft tissues, they form nonspecific, firm nodules, apparently but not actually circumscribed, and they regularly metastasize through the blood stream. They are to be considered among the more malignant of the soft tissue tumors and dealt with by drastic surgical measures. Radiotherapy is without curative effect. The nonorganoid granular cell tumors, generally considered to be benign, may very rarely act as malignant tumors. This can occur in about 1 per cent of the benign granular cell myoblastomas.

Table 6
32 Malignant Organoid Granular Cell Myoblastomas
(So-called Malignant Nonchromaffin Paragangliomas or Alveolar Soft Part Sarcomas)

Retroperitoneum	
Mesentery and Omentum	2
Mediastinum	0
Orbit	0
Head and Neck	0
Trunk	7
Upper Extremity	6
Lower Extremity (Thigh 14)	17

Angiosarcoma

This term has been used to cover all of the different varieties of malignant tumors featuring blood vessels and their cells. But when this is done, tumors of vastly different degrees of malignancy and behavior are thrown together in a common heap which certainly does not make for intelligent treatment. Here they will be dealt with in four separate categories: Malignant hemangioendothelioma, a vascular tumor featuring endothelioblasts; malignant hemangiopericytoma, a malignant vascular tumor featuring pericytes; lymphangiosarcoma, another highly specialized lymphatic vessel tumor featuring lymphatic endothelioblasts; and Kaposi's sarcoma, a highly specialized malignant vascular tumor, the exact nature of which is still a mystery.

Malignant Hemangioendothelioma

This is the standard malignant vascular tumor which forms capillaries and sinuses connected with the circulating blood and is featured by the proliferation of malignant anaplastic endothelioblasts. It is necessary to indicate that it is malignant by the use of that adjective because there is a more common benign variant of the tumor in which endothelial cells of a benign type heap up inside of the capillaries of the vascular neoplasm. This latter type is found especially in children. The malignant variety is very uncommon. It occurs at any age and without important sex variations. While there is no known case of a malignant hemangioendothelioma developing from one of the benign type, the history of the malignant hemangioendothelioma sometimes suggests that it may develop from an organizing hematoma resulting from trauma. It is unknown whether or not this is actually the case, for an undiscovered preexisting malignant hemangioendothelioma may form a hematoma when traumatized. Because the malignant endothelioblasts are easily detached from the vessel wall and are carried away by the circulating blood, metastasis to the lungs and elsewhere is a common event and probably an early one. Thus, these are among the

most malignant of the sarcomas. The tumor generally is deeply situated at the muscular level in the soft tissues (Table 7), and its essential vascular nature may not be suspected until the incision reaches its very vascular environs. Very wide block excision or, if necessary, amputation is the only treatment with any hope of cure. Roentgenotherapy is not known to have cured any case.

Table 7
35 Malignant Hemangioendotheliomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	0
Mediastinum	1
Orbit	1
Head and Neck	7
Trunk	8
Upper Extremity	3
Lower Extremity (Thigh 10)	15

Malignant Hemangiopericytoma

The hemangiopericytoma is a tumor form which has been recognized and named only since 1942 and is so uncommon that information concerning it has accumulated very slowly. It is a vascular tumor made up of capillaries lined with normal endothelial cells but with a marked perivascular proliferation of rounded or elongated cells believed to be pericytes. Pericytes are cells with long processes with contractile properties stretched out over the surface of a capillary, which control the calibre of the capillary lumen. Most of the hemangiopericytomas are benign tumors and they may appear in childhood as well as at any time in adult life. They are found just as often in the internal structures as in the external soft tissues. The majority of those in the external tissues are beneath the skin in the subcutaneous or muscular layers. They are generally rounded tumors which grow both by infiltration and expansion and they seldom attain a diameter greater than 15 cm.

Unfortunately, there is as yet no certain way to distinguish the benign from the malignant tumors. The growth rate is enormously variable. Many tumors have an initial period of growth activity. If incompletely removed while this growth activity is in being, the persisting tumor will continue to grow and infiltrate. If not touched, tumors have been known to reach their growth limit and to remain inactive and in a status quo for 50 to 60 years. Some of the tumors during the active growth period have metastasized to the lungs and killed. Unfortunately, because of incomplete statistical information, we do not know how many of the recorded cases have metastasized. Because of this uncertainty the only cases which will be recorded here as malignant are the 21 cases known to have metastasized out of 197 hemangiopericytomas recorded (Table 8). Metastases reached the lungs or liver in every case and, in some, other sites as well.

Table 8
21 Malignant Hemangiopericytomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	5
Mediastinum	2
Orbit	0
Head and Neck	1
Trunk	1
Upper Extremity	0
Lower Extremity (Thigh 9)	12

Lymphangiosarcoma

There occurs sometimes in areas of chronic lymphedema a peculiar malignant tumor characterized by a malignant proliferation of the endothelial cells of the lymphatic vessels which proceeds both inside the vessels and outside of them in the edematous

stroma (Table 9). The great majority of reported cases have been in the chronically swollen arms following treatment of cancer of the breast either by radical operation, roentgenotherapy or both. Why it should be found in this variety of lymphedema and hardly ever in cases of chronic lymphedema due to other causes is not known. It extends by insidious infiltration along both the skin and deeper lymphatics. Probably it metastasizes frequently to the lungs but it is difficult to form a definite opinion about this because the great majority of women have had a carcinoma of the breast. Because the tumor often makes multiple independent or confluent hemorrhagic foci in the skin it is easily confused with Kaposi's sarcoma. Biopsy will serve to distinguish between the two lesions. Disarticulation of the arm or interscapulothoracic amputation has been carried out in most cases. Usually it is not successful in checking the spread of the disease.

Table 9

7 Lymphangiosarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	0
Mediastinum	0
Orbit	0
Head and Neck	0
Trunk	0
Upper Extremity	6
Lower Extremity (Thigh 1)	1

Kaposi's Sarcoma

Although it generally makes its first appearance in the skin, this very peculiar condition must be considered with the malignant vascular tumors of the soft tissues. Actually the exact nature of the process is unknown but the majority of observers consider it a form of vascular neoplasm. The basic lesion consists of a joint proliferation of capillaries intermingled with cords of spindle-shaped cells resembling fibroblasts. These generally appear as multiple foci in the skin of the legs and feet and are usually bilateral (Table 10). The disease progresses slowly in elderly people, chiefly men, involving more and more of the body surface and eventually the lymph nodes and viscera. There are, however, endless variations of this usual order of events; the disease may first manifest itself as a solitary lesion anywhere on the body surface, or in the mucous membranes, or the first appearance may be visceral or in lymph nodes. There are many other peculiarities; in addition to the greater frequency in males, there is an apparent greater frequency in diabetics, in Jews and Italians, in the Bantus of South Africa (but not in the American Negro) and, an occasional coincidence of Kaposi's sarcoma with one or another form of malignant lymphoma in the same individual. While the clinical diagnosis is usually accurate in the ordinary case, in its many unusual manifestations, it can only be made by biopsy. There is no effective curative treatment. Roentgenotherapy may cause individual lesions to disappear but this does not stop the spread of the process.

Table 10

55 Kaposi's Sarcomas of the Soft Tissues*

Retroperitoneum	
Mesentery and Omentum	0
Mediastinum	0
Orbit	0
Head and Neck	4
Trunk	3
Upper Extremity	11
Lower Extremity (Thigh 2)	37
Generalized	*6*

**This table records regions where lesions first appeared.*

Synovial Sarcoma

This rare and interesting tumor is found most frequently in the extremities (Table 11), situated rather deeply in the subcutaneous or muscular layers. Contrary to what one might suppose, it

Table 11
77 Synovial Sarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	0
Mediastinum	0
Orbit	0
Head and Neck (Hypopharynx 1)	5
Trunk	2
Upper Extremity (Wrist 4, Hand 2)	25
Lower Extremity (Thigh 32)	45

does not arise from the normal synovial elements although it is composed of synovioblasts as has been repeatedly demonstrated by tissue cultures. It must be supposed that it comes from embryonally segregated synovioblastic cells in the vicinity of joints or else that there are mesenchymal derivatives in the vicinity of joints capable of forming malignant synovioblasts by metaplasia. Those affected may be of either sex and more commonly are young adults. Occasionally it is seen in children but very rarely in people over the age of 50 years. The tumors are quite variable in speed of growth and in differentiation. They seldom attain a large size. They infiltrate the adjacent tissues and regularly recur locally if incompletely excised. Metastasis occurs through the blood stream to the lungs and elsewhere as well. Except that it is most apt to be found in the vicinity of joints and more particularly in those of the lower extremities, and on rare occasions shows shadows of calcium density in roentgenograms, there is nothing which will enable one to suspect a synovial sarcoma on clinical examination. The diagnosis must depend upon study of a biopsy specimen. Even this may not permit a positive diagnosis, for this tumor is composed of two different-appearing cell types, only one of which may be present in the biopsy. It is possible, however, to recognize a malignant form of the sarcoma which requires radical surgery. Unfortunately, a great majority of these very malignant tumors have already metastasized when first seen.

Osteogenic Sarcoma and Chondrosarcoma

Among the many versatilities displayed occasionally by the tumors of the soft tissues is the capability of the mesenchymal tissues to form benign and malignant bony and cartilaginous tumors quite independent of the skeleton. Such tumors are very rare and are therefore puzzling and disconcerting when encountered. Histologically they are quite comparable to their counterparts arising in skeletal tissues and one applies the same criteria in differentiating between benign and malignant. The bony tumors have to be differentiated from nodules of myositis ossificans. This may be difficult because both benign and malignant nodules interdigitate with the surrounding muscles and histologically some myositis nodules are composed of somewhat atypical bone or osteoid tissue. It is only safe to call such a nodule osteogenic sarcoma if the evidence is unmistakable. Most of the extraskeletal carti-

Table 12
17 Osteogenic Sarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	1
Mediastinum	0
Orbit	0
Head and Neck	0
Trunk	2
Upper Extremity	3
Lower Extremity (Thigh 9)	11

laginous tumors are benign but a few have proved to be malignant and capable of metastasis. The osteogenic sarcomas of the soft tissues are extremely malignant, while the chondrosarcomas are less often metastasizing tumors. In this respect they behave very much like their counterparts which arise in the skeleton. The distribution of both types is shown in Tables 12 and 13.

Table 13
36 Chondrosarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	0
Mediastinum	0
Orbit	0
Head and Neck	5
Trunk	11
Upper Extremity	6
Lower Extremity (Thigh 8)	14

Reticulum Cell Sarcoma

Although lymphosarcoma and leukemia may involve the skin as secondary manifestations, and certain variants of the malignant lymphomas, such as mycosis fungoides may involve it primarily, these will be dealt with in the section on the skin. Perhaps related to that group but maintaining a sufficient degree of autonomy to warrant considering it as a separate entity is the reticulum cell sarcoma which arises as a primary tumor in the subcutaneous and muscular layers and seemingly has no connection with the lymph nodes and other lymphoid stations in the body. These tumors, histologically, have the characteristics of reticulum cell sarcomas. They develop at any age and in either sex without known etiological factors. The deep-seated nodules generally grow rapidly, infiltrate and recur promptly unless treated by wide excision or by radiotherapy or both. Metastasis is commonly through the blood stream although regional lymph

Table 14
93 Reticulum Cell Sarcomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	5
Mediastinum	0
Orbit	0
Head and Neck	13
Trunk	18
Upper Extremity	30
Lower Extremity (Thigh 16)	27

nodes are sometimes affected by metastatic deposits. The distribution of these tumors in the soft tissues is shown in Table 14.

Surgical excision must be wide of the palpable tumor if it is to succeed. If there is any doubt, postoperative radiotherapy may be effective. Since these are sensitive tumors, treatment may be by radiotherapy alone after biopsy.

Malignant Giant Cell Tumor

(*Malignant Xanthoma, Malignant Histiocytoma, Xanthogranuloma*)

Giant cell tumors as well as fibrous xanthomas and benign histiocytomas are not very uncommon in the soft tissues, especially in the skin, subcutaneous tissues, and in connection with tendons, tendon sheaths and joint capsules. The vast majority of them are benign but very occasionally one of these tumors may be malignant. Malignancy is shown by mitoses and by unchecked infiltrative growth. None of the cases in our group is known to have metastasized but metastasis has been reported from other clinics. The retroperitoneal and mediastinal growth which has been called xanthogranuloma should also be considered as belonging to this group. Insofar as our own experience goes, these have proved to be nonmetastasizing lesions. They have, however, been so extensive in some cases that complete excision has proved impossible and recurrences have proved

fatal. Because of this, 13 retroperitoneal and three mediastinal examples have been included with the superficial tumors in Table 15.

Table 15
23 Malignant Giant Cell Tumors
(Malignant Xanthoma; Malignant Histiocytoma; Xanthogranuloma)

Retroperitoneum	
Mesentery and Omentum	13
Mediastinum	3
Orbit	0
Head and Neck	4
Trunk	1
Upper Extremity	1
Lower Extremity (Thigh 0)	1

Malignant Plasma Cell Tumor
(Plasmacytoma)

Occasionally a true neoplasm composed of plasma cells makes its first appearance in the soft tissues. It has been maintained by some that this invariably heralds the appearance of similar tumors in the bone marrow as one form of multiple myeloma. No doubt this is frequently the case and it is very difficult to deny since sometimes 10 or more years elapse between the appearance of the extraskeletal nodule and the development of the characteristic lesions in the bone marrow. Nevertheless, it can

Legends

Fig. 1. Fibromatosis of the toe of a six-months-old white boy present since the age of one month. After biopsy the toe was amputated. During the next five years similar growths appeared on two other toes. At the age of 10 years there were fibromatoses involving both feet.

Fig. 2. Well-differentiated fibrosarcoma of back. Negro female, 45 years old. It had been present one year when it measured 12 x 10 x 8 cm. It lay in the subcutaneous fat and in the right half of the paraspinal muscles. After biopsy a wide removal was carried out and the area skin grafted. No recurrence after three months.

Fig. 3. Well-differentiated fibrosarcoma of back showing size of tumor and extent of surrounding uninvolved tissues removed. Same case as Fig. 2.

Fig. 4. Malignant hemangioendothelioma of sternal region. White female, 54 years old. It had been present for eight months and during the preceding three and one-half months had been heavily irradiated. The tumor was fixed to the chest wall and a portion of the sternum and adjacent costal cartilages were removed with it. She died four days after operation. At autopsy metastases were found in the lungs but nowhere else.

Fig. 5. Malignant hemangioendothelioma of sternal region. Cross section of resected specimen showing extension of the tumor between the costal cartilages to reach the mediastinum. Same case as Fig. 4.

Fig. 6. Malignant mesenchymoma of buttock. White female, 60 years old. There had been swelling and pain in the right gluteal region for two months. Six days after a biopsy diagnosis, the gluteus maximus muscle, containing the large tumor, together with the overlying skin and subcutaneous tissues were excised as a single mass. There was no evidence of recurrence of this tumor but 10 years later she died of carcinoma of the breast with metastases to lungs and spine.

Fig. 7. Malignant schwannoma of the musculocutaneous nerve in a case of von Recklinghausen's disease. Negro woman, 22 years old. Mother and maternal aunt have multiple neurofibromatosis. This young woman had multiple neurofibromas, marked kyphoscoliosis and there had been a tumor in the arm for five months which had been intermittently painful. The left upper extremity was disarticulated at the shoulder. In addition to the tumor the roots of C6, C7, C8 and T1 were involved with multiple neurofibromas. She died 10 and one-half months after disarticulation with evidence of massive lung metastases.

Fig. 8. Malignant schwannoma of the musculocutaneous nerve. The nerve is enlarged by proliferation of tumor cells inside the epineurium producing fusiform enlargement and, in addition, the tumor has invaded the tissues outside of the nerve. Same case as Fig. 7.

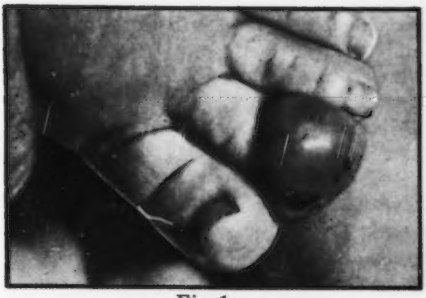


Fig. 1

Fig. 2

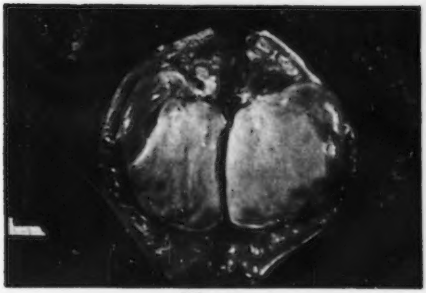


Fig. 3

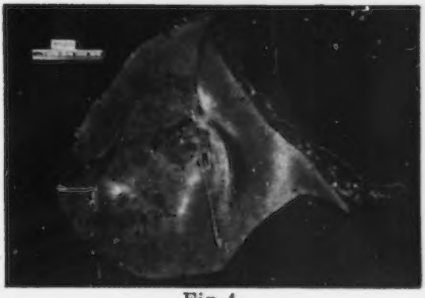


Fig. 4

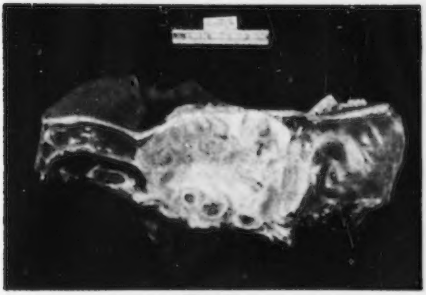


Fig. 5

Fig. 6

Fig. 7

Fig. 8

be stated that as yet it has not been possible to prove this relationship in every case and it seems worthwhile to treat the rare solitary lesions as if they were curable and either excise them widely or treat them by radiotherapy. Wide excision is probably the more reliable form of treatment. Distribution of the tumors is shown in Table 16.

Table 16
7 Malignant Plasma Cell Tumors
(Plasmacytoma)

Retroperitoneum	
Mesentery and Omentum	1
Mediastinum	0
Orbit	0
Head and Neck	1
Trunk	4
Upper Extremity	1
Lower Extremity	0

Malignant Mesenchymoma

Most of the tumors that have been described up to this point have been composed of a single cell type with the possible exception of Kaposi's sarcoma and the malignant giant cell tumors, the precise cellular composition of which is not understood. There is in addition, a group of benign and malignant tumors which are definitely composed of more than one recognizable type. The majority of such mixed mesenchymal tumors or mesenchymomas are malignant. They are made up of two or more sarcoma types which ordinarily are not found together. A fibrosarcomatous element is not counted because almost any type of differentiated mesenchymal cell is capable of functioning as a fibroblast. Furthermore, if differentiated nonsarcomatous elements, such as bone or cartilage, are found in a tumor, they are not considered as additional elements but simply as manifestations of metaplasia. This leaves for consideration tumors with such bizarre combinations as reticulum cell sarcoma, osteogenic sarcoma, and liposarcoma, or synovial sarcoma and rhab-

Legends

Fig. 9. Liposarcoma of thigh and popliteal space. Negro male, 58 years old. A mass had been present for eight months. It was large enough to interfere with flexion of the leg at the thigh. After biopsy diagnosis a high thigh amputation was done because wide local removal was impossible. No recurrence seven months after operation.

Fig. 10. Liposarcoma of thigh and popliteal space. The dissected tumor shows yellow color, nodular form and the engulfment of the popliteal vessels and nerves. Same case as Fig. 9.

Fig. 11. Myxoma of arm. Negro girl, 18 years old. It was said to have been present since birth. It had slowly been increasing in size during the past three years. After biopsy and quick frozen section diagnosis, the biopsy wound and the tissues surrounding the tumor were widely excised. The tumor lay in the tendon of the pectoralis major muscle at its insertion into the humerus. No recurrence or interference with function after three years.

Fig. 12. Synovial sarcoma of antecubital fossa. White male, 27 years old. Symptoms of pain and tumor for four years. The tumor lay between the biceps and brachioradialis muscles. After biopsy diagnosis the upper extremity was disarticulated at the shoulder joint. He remained well for nine years, then metastases appeared in both lungs and he died nine years and 10 months after amputation. The photograph shows the position of the tumor with the surrounding muscles and the radial nerve.

Fig. 13. Juvenile rhabdomyosarcoma of scapular region. White girl, 10 years old. The large tumor had only been noticed for six weeks and had been growing rapidly. There was already evidence of metastases to the lung.

Fig. 9

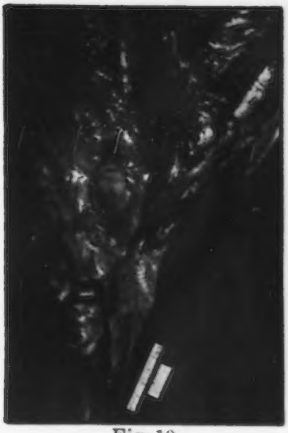


Fig. 10

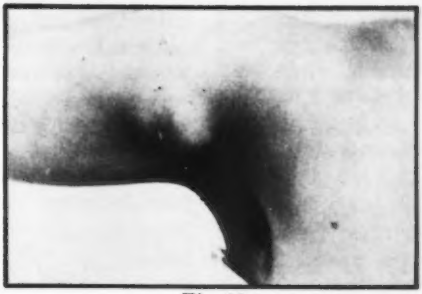


Fig. 11

Fig. 12

Fig. 13

domyosarcoma. Possible combinations are many and varied.

These are very malignant tumors with a high rate of metastasis and since they always infiltrate, there is a high recurrence rate if they are incompletely excised. There are no gross features which can help one to recognize this type of growth and diagnosis can only be made after histological study. See Table 17.

Table 17
143 Malignant Mesenchymomas of the Soft Tissues

Retroperitoneum	
Mesentery and Omentum	17
Mediastinum	3
Orbit	4
Head and Neck	10
Trunk	27
Upper Extremity	24
Lower Extremity (Thigh 44)	58

Malignant Schwannoma and Neuroepithelioma

The peripheral nerves occasionally are the site of origin of malignant tumors which, because they develop in the same parts as do the previously described sarcomas and imitate their appearance, are described at this point for the sake of convenience. Actually, they are formed of cells derived from the neuroectoderm rather than the mesenchyme and are not properly classified as sarcomas. The malignant schwannomas (Table 18) have certain histological features which aid in distinguishing them but since they have a considerable number of connective tissue fibers in their make-up, it is quite difficult to distinguish them from fibrosarcomas. These fibers are made by the Schwann cells and not by fibroblasts derived from the mesenchyme. The neuroepitheliomas (Table 19) are easier to recognize because they reproduce in their growth the histological appearance of the neuroepitheliomas and medulloblastomas of the central nervous system. Both varieties occur somewhat more frequently in males and the individuals affected are usually young or middle-aged adults although children and elderly people are not exempt.

Table 18
55 Malignant Schwannomas

Retroperitoneum	
Mesentery and Omentum	6
Mediastinum	1
Orbit	0
Head and Neck	10
Trunk	13
Upper Extremity	10
Lower Extremity	15

About one half of these malignant tumors of peripheral nerves develop in individuals suffering from multiple neurofibromatosis (i.e., von Recklinghausen's disease). In this disease of the nervous system the peripheral nerves often become thickened and tortuous, producing what is called a plexiform neurofibroma. This may become malignant in either one of two different ways. The proliferation of Schwannian cells inside the nerve sheath may extend proximally toward the spinal roots eventually involving them and finally the cord itself. In this type of involvement the sheath is not penetrated and metastasis does not take place. This occurs only with malignant schwannomas. The second type of growth extension takes place both proximally and

Table 19
22 Neuroepitheliomas and Medulloblastomas

Retroperitoneum	
Mesentery and Omentum	2
Mediastinum	2
Orbit	0
Head and Neck	3
Trunk	3
Upper Extremity	7
Lower Extremity (Thigh 4)	5

distally within the sheath but it also penetrates through the sheath into the surrounding soft tissues where a nodular tumor is formed. This growth variant is found in both the malignant schwannoma and the neuroepithelioma and metastasis is frequent through the blood stream. The neuroepitheliomas may also metastasize to the regional lymph nodes.

One may suspect the presence of such tumors in the larger nerves if a mass is formed which can be moved in the transverse axis of the nerve but not in its longitudinal axis. Sometimes pain, tenderness, paresthesia, or some other evidence of interference with the nerves' function may be present but all too frequently this is absent. For the malignant tumors outside of the nerve sheaths only the most drastic surgery has any chance of cure, for usually the tumor has already metastasized by the time it is first recognized. For the progressive malignant schwannoma of a plexiform neurofibromatosis, an attempt may be made to excise the affected nerves proximal to the intraneural extension but this may not succeed for the process sometimes seems to be multicentric and the proliferation may continue within the sheath of the proximal stump.

Summary

Although there are at least 21 different varieties of malignant soft tissue tumors, some general statements can be made about the problems of their diagnosis and treatment. In the first place benign tumors are at least five times as common in the soft tissues as are malignant growths. Of all the regions, the lower extremities are most frequently involved and the thigh in particular is a favored site for sarcoma growth. Because so many of them are deeply seated, growth is apt to be insidious. The tumor seldom causes pain or interference with function so that even after the patient notices a swelling or a definite lump no attention may be paid to it until it has been increasing in size for months or even over a year, and occult blood stream metastases may already be present. If the tumor is a sarcoma, in the vast majority of cases no matter how circumscribed it may feel, the probabilities are that growth has been by infiltration at the periphery as well as by expansion so that there will be no true capsule. Metastases, when they occur, most commonly go by embolism through the blood stream and rarely travel through the lymphatics to the regional nodes. In the great majority of cases successful treatment means very radical surgery with minimal disturbance of the local tumor. Radical surgery can be deforming and crippling and is a deplorable procedure if the tumor is benign. Since the only way to be certain that a tumor is malignant is by microscopic examination, biopsy should be carried out first. This serves two purposes: Not only does it determine whether the tumor is benign or malignant but it also reveals its histological type and whether it is a primary or secondary growth or some nonneoplastic lesion. Information of this sort is essential if the treatment is to be carried out with intelligence. If the biopsy procedure is done carefully in a relatively bloodless field, the hazard of spreading tumor by cutting into it is slight. This is further minimized by so placing the biopsy wound that the whole wound area can be removed with the tumor if it should prove to be malignant. Cutting out the mass alone without biopsy is to be deplored because this distributes tumor cells widely throughout a large wound area and increases the danger of metastases

LOCATION OF 2095 MALIGNANT TUMORS OF THE SOFT TISSUES AND PERIPHERAL NERVES

Recorded in the Surgical Pathology Laboratory, Columbia University, N. Y.

SITE OF TUMOR	TYPE OF TUMOR: FIBROMATOSES	DIFFERENTIATED FIBROSARCOMA	MALIGNANT FIBROSARCOMA	MYXOMA	LIPOSARCOMA	LEIOMYOSARCOMA	RHABDOMYOSARCOMA	MALIGNANT ORGANOID GRANULAR CELL TUMOR	MALIG. HEMANGIOENDOTHELIOMA	MALIG. HEMANGIOPERICYTOMA	LYMPHANGIOSARCOMA	KAPOSI'S SARCOMA	SYNOVIAL SARCOMA	OSTEOGENIC SARCOMA	CHONDROSARCOMA	RETICULUM CELL SARCOMA	PLASMACYTOMA	MALIGNANT G. C. TUMOR AND XANTHOGRANULOMA	MALIGNANT MESENCHYMOMA	MALIGNANT SCHWANNOMA	NEUROEPITHELIOMA	TOTAL
RETROPERITONEUM—MESENTERY—OMENTUM	8	7	2	6	70	61	12	2	0	5	0	0	0	1	0	5	1	13	17	6	2	218
MEDIASTINUM	0	2	2	0	5	1	5	0	1	2	0	0	0	0	0	0	0	3	3	1	2	27
ORBIT	0	0	1	4	2	2	19	0	1	0	0	0	0	0	0	0	0	0	4	0	0	33
HEAD & NECK	45	32	9	23	29	11	20	0	7	1	0	4	5	0	5	13	1	4	10	10	3	232
TRUNK	46	118	37	24	65	9	44	7	8	1	0	3	2	2	11	18	4	1	27	13	3	443
UPPER EXTREMITY	65	62	26	25	49	3	17	6	3	0	6	11	25	3	6	30	1	1	24	10	7	380
LOWER EXTREMITY (Thigh)	30 (14)	47 (17)	94 (52)	35 (20)	216 (164)	18 (14)	64 (38)	17 (14)	15 (10)	12 (9)	1 (1)	37 (2)	45 (32)	11 (9)	14 (8)	27 (16)	0 (0)	1 (0)	58 (44)	15 (7)	5 (4)	762 (475)
TOTAL	194	268	171	117	436	105	181	32	35	21	7	55	77	17	36	93	7	23	143	55	22	2095

even if later a more radical removal of the entire wound area is done. Excision without biopsy is only justifiable when a tumor is small and is so situated that sacrifice of a wide clinically free zone all around it can be carried out without causing important crippling and deformity.

There is little hope of inducing patients to consult doctors at an earlier time for asymptomatic soft tissue tumors. There is hope that physicians and surgeons can be induced to insist on biopsies of deep-seated soft tissue masses and institute an earlier and more intelligent planning of therapy.

The American Cancer Society announces the publication of a booklet entitled Carcinoma of the Pancreas, Biliary Tract and Liver by Howard F. Raskin, M.D., Robert D. Moseley, Jr., M.D., Joseph B. Kirsner, M.D., and Walter L. Palmer, M.D. The booklet consists of reprints of a two-part article, including color plates, which first appeared in the 1961 issues of CA.

Copies will be available from the Divisions of the American Cancer Society.

Unproven Methods of Cancer Treatment

The following statement on Antineol, the preparation proposed by Henry K. Wachtel, M.D., was recently distributed to the 60 Divisions of the American Cancer Society for their information.

Antineol

Antineol, the preparation proposed by Henry K. Wachtel, M.D. for treatment of cancer, is described by him as a crystalline polylipide extracted from the posterior lobe of the pituitary glands of cattle. Although Dr. Wachtel has reported using pituitary extracts to treat cancer since 1948, and had called a preparation used in 1950 "Cancer Checking Lipide (CCL)," the name Antineol (anti-neoplasm) was apparently not applied until 1951 when he discovered a method of crystallizing the pituitary fraction employed for treatment.

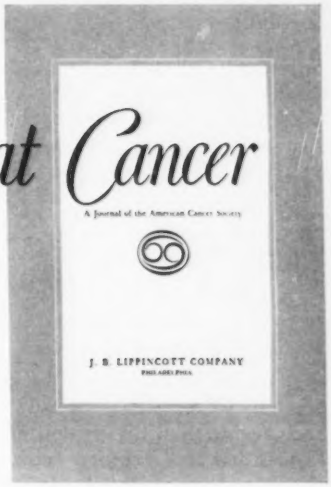
Dr. Wachtel was born in Poland in 1890, and was graduated, Faculty of Medicine, University of Vienna, in 1914. He came to the United States in May, 1941. The following year he was licensed to practice medicine in New York State and opened a private practice in New York City. He was Associate Professor of Physiology and Director of the Cancer Research Department of Fordham University from 1947-49, and continued as Associate Professor of Physiology until 1950. He has been Scientific Director of the Chemical Hormone Corporation, 670 Lexington Avenue, New York 22, New York, from 1950 to date.

The Chemical Hormone Corporation was organized under the laws of New York State in December, 1947, to engage in research and in the manufacture of new hormonal substances. Its officers were: Prof. Horace Taylor, economist, of Columbia University, Chairman of the Board; Henry Wachtel, M.D., President, and Alexander Rostocki, Secretary. Dr. Wachtel's son, Joseph S. Wachtel, J. D., served as Executive Director. Another group using the same address, the General Research Foundation and Institute, stated in fund-raising letters in 1949 that "this Foundation, without limiting itself to any specific field, dedicates its efforts to assist individuals who are unable to gain support for important scientific work." Its hormone project of that date was the development of new hormones of the pituitary gland, and the scientist in charge was Henry K. Wachtel, M.D.

In 1949, a single scientific investigator, and a team of three others, both reviewed Dr. Wachtel's evidence and examined patients treated with his preparation. Both found a slight increase in the sense of well-being, but no effect on cancers of patients receiving this treatment. In 1950, three other investigators, under the auspices of three pharmaceutical firms, conducted clinical trials on a total of 15 patients. They reported no detectable effect on cancer. An attempt by the Committee on Cancer Diagnosis and Therapy of the National Research Council to set up a clinical study of a larger group of patients in 1954 failed when Dr. Wachtel said it would be impossible to supply the agent for such studies.

After careful study of the literature and other information available to it, the American Cancer Society has found no evidence that treatment with Antineol results in any objective benefit in the treatment of cancer in human beings.

Looking at Cancer



A commentary on the November-December, 1961 issue of CANCER, a journal of the American Cancer Society, Inc.

John W. Berg, M.D.
Associate Editor, Cancer

The progress of metastatic breast cancer often can be slowed by adrenalectomy. Treatment would be simpler and more widely available if cortisone or some similar compound could produce a functionally equivalent state. Unfortunately, as Dao and his coworkers from Roswell Park Memorial Institute show, this just does not happen. In a random study, objective responses were seen in almost half the surgically treated patients, but in none of those treated by hormones. This of course contradicts previous favorable reports on cortisone but the authors account for the difference on the basis of their truly strict criteria for response. They demanded substantial regression, not just of skin nodules, but of the visceral lesions that limit the patient's comfort and function.

From Roswell Park Memorial Institute also, Pickren provides data to comfort the conscience of pathologists and surgeons. They have always known that when they studied the axillary nodes of patients with breast cancer by single sections, they were not seeing all the cancer. After all, one section represents only a small part of 1% of the thickness of the node. Pickren with serial sections found cancer in 22% of "negative" axillas. The important thing however is that he has five-year follow-up on his cases and whether or not there were occult metastases, it made no difference. Prognosis was related only to gross metastases. He concludes that routine examination does not overlook important evidence; it tells all that is important.

From Vienna, Denk and Karrer review for American readers their experiments in combined surgical-chemotherapeutic treatment of cancer and conclude with an extremely optimistic report on its use in human lung cancer. A total of 147

patients had radical resections of stage I - II lung cancer (cancer apparently encompassable by radical surgery). In the first six months, 20 of 66 patients who did not get chemotherapy died, but only one of 81 who had received courses of Mitomen, Endoxan, or both, died. In the second six-month period for slightly smaller groups the mortality had risen to 44% of control patients, 14% of the treated, and in the third six-month period, the figures were 58% and 19% respectively. During this time multiple courses of chemotherapy were given to the survivors rather than limiting treatment to one course at the time of operation. The results should not arouse too much hope yet. The time of follow-up is too short to be speaking of increased number of cures since in a previous study there was the same sort of success the first year, but by the end of the second year no more patients were alive among the treated group than among the controls.

Concerning lung cancer, the great mass of evidence against cigarettes keeps mounting. It has been known that crude tobacco smoke condensate is more carcinogenic than the content of specific aromatic hydrocarbons would suggest. Wynder and Hoffman now show how the phenols in the smoke promote carcinogenesis and potentiate the primary agents and so increase the efficiency of the system as a whole. A report by Hayashi, Cowdry, and Suntzeff offers support to those who would have carcinogenesis be first of all an alteration of connective tissue under epithelium. They found that pathologic changes in bronchial ground substance, basement membranes and elastic fibers were particularly marked in smokers just as in epithelial atypia. The changes were similar to those produced by other carcinogens, such as radiation and arsenic-tar compounds.

Citing 15 cases, Stout reports that children as well as adults may develop pseudosarcomatous fasciitis. The lesion is dangerous not because of its growth potential (it rarely recurs, much less does it act malignant) but because its sudden appearance and/or bizarre histology may lead to overdiagnosis and overtreatment. It is primarily a tumor of extremities and often, but not always, subcutaneous. In this series all patients were treated successfully by conservative excision.

Adenoid cystic carcinoma is the subject of a report by Moran and his associates. These tumors, most common in the hard palate and major salivary glands are slowly but inexorably growing cancers that cannot be handled by local excision. Such treatment invariably failed in this series. Radiation usually produced temporary but never permanent responses. Early radical surgery offers the only hope; perhaps wider recognition of the true nature of these cylindromas will lessen the reluctance to apply it.

Albany Medical Center Hospital, Albany, New York. Inset: Charles Eckert, M.D.

Extended Radical Operations for Cancer

The editor interviews Charles Eckert, M.D., Professor and Chairman, Department of Surgery, Albany Medical Center Hospital, Albany, New York.

DR. GRANT: *Dr. Eckert, you have recently written about extended radical operations for the treatment of cancer. What sort of operations are these?*

DR. ECKERT: Extended radical operations are a recent development for use in highly selected conditions in the treatment of cancer. They differ from classical radical cancer operations in that they are designed to better circumscribe the entire disease process by removal of contiguous viscera or other adjacent anatomical structures along with the tumor.

DR. GRANT: *What are some examples of this type of operation?*

DR. ECKERT: In carcinoma of the breast, removal of a portion of the chest wall along with the internal mammary vessels and the lymph nodes as described by Urban; radical neck dissection combined with jaw resection for head and neck cancer; pelvic exenterations for cancer of the pelvic organs; multivisceral excisions for cancer of the stomach or pancreas, etc. and certain amputations of extremities.

DR. GRANT: *Are these operations more radical than the "so-called" radical operations?*

DR. ECKERT: Yes. The term "extended operations" seems to be more meaningful than radical. After all, inadequate surgery may be considered radical, depending upon your point of view.

DR. GRANT: *What has brought about development of these extended operations?*

DR. ECKERT: The obvious and usual explanation is, of course, that they have been made possible by the adjuncts to surgery such as improved understanding of physiology and newer developments in anesthesiology, availability of blood, etc. Also, careful study of the end results of treatment have indicated to us areas where improvement could be made. Necropsy studies have repeatedly shown that in head and neck cancer for example, systemic metastases occur late in only a small number of cases. Braun and Martin found, in a study of 284 cases of patients dying of head and neck cancer, that systemic metastases were present in only 23 per cent.

DR. GRANT: *Apparently most treatment failures in head and neck cancer result from the inability to control the primary lesions and cervical metastases?*

DR. ECKERT: Yes, and by developing an extended operation in which the jaw or other parts of the head and neck region are removed to assure wide removal of the primary lesion, as well as all the regional lymph nodes, many more cases are being cured.

DR. GRANT: *Isn't cervix cancer somewhat similar?*

DR. ECKERT: Yes. Drs. Brunschwig and Pierce, for example, found that in 65 necropsies on patients dying of cancer of the cervix, the disease was limited to the pelvis in half of them. This led to, and justifies, the pelvic exenteration operation in selected individuals.

DR. GRANT: *What about mammary cancer? The complete gamut of operative possibilities are being advocated by various well-known surgeons, with some favoring simple mastectomy for cancer of the breast. How is it possible for an equally authoritative group of surgeons to recommend Urban's extended operation, which includes removal of the internal mammary nodes with chest wall resection combined with the standard radical mastectomy?*

DR. ECKERT: I believe the chest wall resection of Urban is a logical extension of radical mastectomy in selected cases. However, because the most important reason for failure of the ordinary radical mastectomy is occult distant metastasis, at the time of operation, the added resection of internal mammary lymph nodes can be expected to increase only slightly present cure rates of surgically treated mammary cancer. This is also the reason why it is difficult to show the inadequacy of simple mastectomy. So many breast cancer patients are lost from distant metastasis that the superiority of radical mastectomy over simple mastectomy is not great in terms of numbers salvaged by the more radical procedure. However, because breast cancer is so common, many lives can be saved by radical surgery.

DR. GRANT: *The operative mortality and the morbidity rates are quite high in extended radical operations. Aren't they sufficient to neutralize the gains?*

DR. ECKERT: No. In terms of survival, Figures 1 and 2 illustrate types of improvement that can be made in survival figures with extended operations.

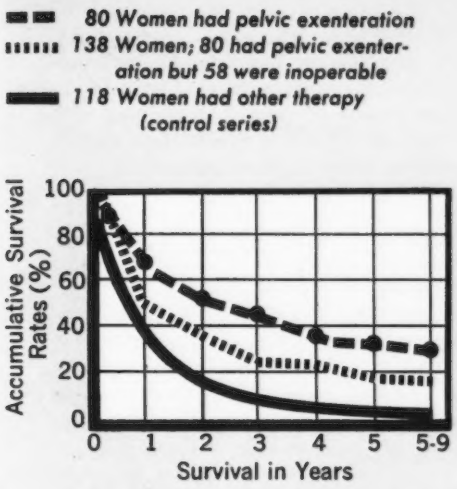


Fig. 1. Accumulative survival rates of women treated for postirradiational cancer of the cervix in the Barnes Hospital 1950 to 1957.

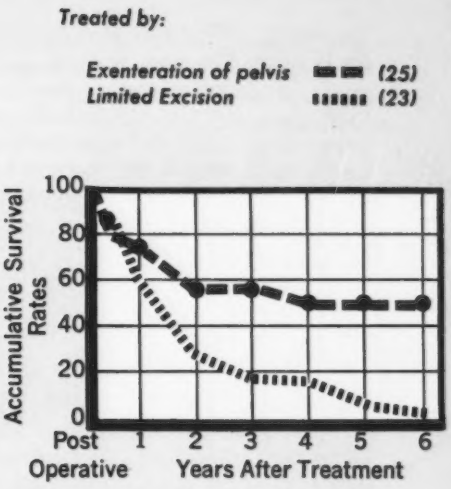


Fig. 2. Survival rates of patients treated by pelvic exenteration for cancer of the rectum.

DR. GRANT: *This is not true for all sites?*

DR. ECKERT: No. For example, in pancreaticoduodenal cancer, radical pancreaticoduodenectomy has not increased survival time over palliative sidetracking procedures.

DR. GRANT: *You mentioned palliation. What about the use of extended operations for palliative procedures?*

DR. ECKERT: This is the most difficult decision to make and disappointment in this area is probably the reason why some physicians have become disillusioned by extended cancer operations.

DR. GRANT: *But palliation can be obtained in some cases?*

DR. ECKERT: Oh, yes. In many patients, the operation is performed hopefully for cure but actually, due to occult distant metastasis, palliation only is actually obtained. The problem lies in balancing the immediate loss of function or deformity which the operation imposes against such future loss and the pain which the tumor causes, and in estimating the time interval involved.

DR. GRANT: *May a patient's condition be made worse as a result of these operations?*

DR. ECKERT: Yes, as a result of certain sequelae or complications of the operation, the patient may be incapable of the integrated mental and physical activities necessary for resuming a useful life. Anything which in consequency of an operation interferes with the patient's ability to function as a useful member of society, has to be considered as part of the morbidity of the operation.

DR. GRANT: *What sort of complications are seen?*

DR. ECKERT: The most common sequelae and complications of extended procedures include disabling emotional reactions, marked physical deformity, the fear of continued growth of cancer, interference with nutritional state leading to physical disability, inadequate adjustment to loss of sexual function or to loss of an extremity, etc.

DR. GRANT: *Are these complications severe enough, or do they occur often enough to be of significant concern in cancer surgery?*

DR. ECKERT: They certainly are significant because when they occur it indicates failure to an extent, even though the patient is cured of cancer. Moreover, the risk of these complications has been used by some who strongly object to the entire concept of extended surgery for cancer. Physicians are at times just as prone to react emotionally to potential deformity as are laymen, losing sight of man's ability to compensate for physical defects.

DR. GRANT: *Can these complications be minimized?*

DR. ECKERT: Oh, yes. Improved surgical technique has made it possible to decrease deformity and diminish interference with speech, deglutition and nutrition in extended head and neck operations. Similarly, improved methods of construction of colostomies and urinary diversions have made pelvic exenteration less of a handicap to patients.

DR. GRANT: *Proper selection of cases and good surgical technique seems to be the key for assuring maximum benefit from extended cancer operations. How can one best select cases?*

DR. ECKERT: Each group, working in this field, must keep its own results under constant surveillance and none can assume that its results are necessarily comparable with those that have been reported by others. Cumulative life expectancy tables should be kept up to date for these will provide a reasonable gauge of the effectiveness with which a procedure is being used. A "useful life expectancy" curve can actually be worked out from an honest appraisal and recording of the disability of patients.

DR. GRANT: *Each case is considered in the light of actual experience and the capabilities of the group responsible for treatment?*

DR. ECKERT: Yes. That's the best way of approaching the problem. We have the capacity for great good in our surgical technique. We must know how and when to properly apply it to the cancer patient to best assure cure or maximum palliation.

DR. GRANT: *Thank you, Dr. Eckert.*

During 1960, the death rate from cancer in New York State, 186.3 per 100,000 population (15,702 deaths), was the highest in three years.

The Current Status of Gastric Cancer*

George T. Pack, M.D.

On January 29, 1961, it was exactly 80 years since Theodor Billroth performed the first gastrectomy with survival by removing an advanced mucinous carcinoma of the stomach. From that time to the present, all definitive and long-term cures have been obtained by this same method, gastrectomy—partial, total or extended total.

Cancer of the stomach still accounts for more than 20,000 annual deaths in the United States. Epidemiological and racial studies have revealed certain interesting data about gastric cancer which may be of practical value in lessening the incidence of the disease. The role of heredity is apparently insignificant in the genesis of cancer of the stomach. The socioeconomic status, however, is a matter of some importance inasmuch as the white men and women lowest on this scale have a gastric cancer incidence more than 50 percent in excess of that for persons in the highest economic class.

Negroes have had a striking rise in the true death rate from gastric cancer, until now the stomach is one of the major sites where the cancer risk is higher among Negroes. Almost half of the colored group develop gastric cancer between 30 and 50 years of age, whereas little more than a fourth of the white group develop this disease during those decades.

According to the 1956 vital statistics of Japan provided by the Japan Welfare Ministry, carcinoma of the stomach caused 54.2 percent of all cancer deaths in males and 39.4 percent in females. In this regard Japan ranks second highest in the world with only Chile outranking it in incidence.

The incidence of gastric carcinoma is very high in Iceland as compared with England and America. The Icelandic diet is rich in smoked animal protein and fat. The prepared food is smoked intermittently over burning sheep dung for 8 to 12 weeks; according to Bailey and Dungal, all food so smoked contains 3,4-benzpyrine.

A most encouraging observation has been the steady decline in stomach cancer death rates in the United States for both men and women during the past several decades, a trend duplicated in some but not all foreign countries: for example, the age-adjusted rates per 100,000 for the United States were 28.8 in 1930 but only 13.0 in 1955. This improvement cannot be attributed only to improvements in surgical technique, higher operability rates and increased numbers of surgical cures.

Diagnosis

In the diagnosis of cancer of the stomach, the roentgenologist is able to make an unequivocal diagnosis of changes compatible with gastric cancer in more than 90 percent of patients. In an additional 3 to 5 percent an inconclusive diagnosis is made with the discovery of a lesion of questionable character.

The chief indication for gastroscopy is in the differential diagnosis of visible defects in the stomach. The value of gastroscopy is not the examination of an unmistakable gastric tumor, but

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rather the establishment of an early diagnosis of cancer and the determination of its operability. The most frequent error of gastroscopy is failure to visualize a lesion known to be present by previous fluoroscopic and radiographic study. Gastroscopic examination serves its purpose only after radiographic study has been completed.

As a supplementary method of diagnosis cytologic examination of gastric content offers considerable aid when roentgenograms and fluoroscopy do not provide conclusive evidence of the presence or absence of gastric cancer. The employment of cytologic examination is unnecessary and meaningless when the diagnosis of gastric cancer is otherwise obvious. Two conditions in which the x-ray diagnosis may sometimes be incapable of indicating benignancy or malignancy are ulcer and polyp of the stomach. Exfoliative cells from the stomach are more difficult to interpret than cells contained in other body fluids because they are subject to the action of digestive ferments.

The question is often asked if gastric ulcers become malignant. The histologic evidence of such conversion is too scant to permit the assumption that gastric ulcer per se is a common precancerous lesion. The engrossing and practical question is not the possibility of secondary malignant degeneration of a chronic gastric ulcer (estimate 5 percent) but, rather, if the ulcerating lesion in the stomach of a given patient is benign or malignant.

Roentgen ray evidence of healing or diminution in the size of an ulcer following conservative medical management is not necessarily an assurance of its benignity. Carcinomatous ulcers can become smaller under conservative medical care but usually they do not heal completely. If one studies the percent of excised gastric ulcers supposedly benign but subsequently found to be cancerous, the amazing fact is revealed that *10 to 15 percent* contain microscopic evidence of cancer within the walls. This offers a cogent argument for early consideration of gastric resection if the ulcer has the slightest tendency to persist.

Treatment

Studies of the dissemination of gastric cancer into regional lymph nodes have indicated that earlier efforts at surgical removal have been far too conservative; the excised specimens have not encompassed the scope of the lymphatic spread. Cancers of the proximal and middle segments of the stomach metastasize to lymph nodes in the juxtacardiac and fundal groups, the splenic hilar groups, the superior pancreatic groups and the infrapyloric and greater curvature groups of lymph nodes with such high frequency that the surgeon in attempting curative surgical efforts is compelled to perform an extended total gastrectomy in order to include these outlying regions of cancer deposits. Cancers in the distal segment of the stomach metastasize to lymph nodes along the lesser and greater curvatures of the stomach, the infrapyloric and retropyloric regions of the stomach and through the ascending lymphatics along the hepatoduodenal ligament to lymph nodes in the portal fissure. Cancers in the distal third of the stomach therefore require a subtotal gastrectomy with meticulous removal of perigastric nodes, including a dissection of lymph nodes along the hepatoduodenal ligament and in the portal fissure; the entire lesser curvature of the stomach is removed and only the greater curvature segment of the fundus preserved for the restorative anastomosis.

In more and more patients the operation of total gastrectomy is therefore

being applied, which should bring into the fold of anticipated or hoped-for cures a greater number of patients with cancer of the stomach. The present extended total gastrectomy includes the previously mentioned removal of vulnerable perigastric lymph nodes, together with the entire stomach, a liberal segment of duodenum, the abdominal esophagus, the spleen and the distal two thirds of the pancreas en masse.

The operative mortality for extended total gastrectomy has been decreasing with the increased experience of gastric surgeons and the training of more resident surgeons in the performance of this complicated but adequate operation. The employment of a laparothoracotomy, instead of the abdominal approach only, has facilitated the performance of the operation and enabled the surgeon to do a more detailed and wider removal of adjacent tissues and to construct a more secure anastomosis to the esophagus, usually above the diaphragmatic level.

The removal of the entire stomach results in certain metabolic disturbances which have been assiduously studied. The dumping syndrome and its attendant abnormalities such as changes in blood volume, coronary spasm and unpleasant vasomotor phenomena can now largely be prevented by the administration of a diet poor in carbohydrates and rich in protein and fat, with multiple small meals daily.

Ingenious methods of rehabilitation by the substitution of other viscera as reservoirs interposed between the esophagus and jejunum have been widely used. Segments of jejunum, transverse colon and the entire right colon have been interposed between the esophagus and duodenum or the esophagus and jejunum in the hope that by functioning as a reservoir and delaying the entrance of food into the small intestine the unpleasant sequela of the dumping syndrome might be avoided. These substitutive stomachs have met with variable degrees of success and failure.

Results

Any estimation of the value of treatment for gastric carcinoma must be based upon a comparison of the results following treatment with a known length of survival for untreated patients with this type of cancer. For the average patient with cancer of the stomach death occurs in less than one year from the onset of the first symptom or sign when no treatment is employed. No patient with untreated gastric cancer is alive at the end of four years; not 10 percent of patients survive for as long as two years from the appearance of the initial symptom.

Any study of end results in the treatment of gastric cancers in terms of attained long-term definitive cures resolves itself into an analysis of surgical methods and their value. For such a study, it is essential to determine three points: (1) the applicability of excisional surgery or the percentage of the total number of those afflicted with the neoplasm for whom extirpation is feasible; (2) the risks involved in efforts to remove the cancer; (3) the effectiveness of gastrectomy when it can be successfully performed.

These points correspond to three questions to which the patient urgently seeks answers: Can the tumor be removed? How much danger is involved in an attempt at its removal? How certain will be the cure if I assume these risks and undergo the operation?

The percentage of patients with gastric cancer in the stage considered suitable for surgical treatment has shown a progressive increase during the past 20 years, from 65 percent to 90 percent

of those patients well enough to be admitted to the surgical service of the hospital. In the Memorial Hospital gastric resection with the intent and hope of cure increased from 15 percent in the decade 1931 through 1940 to 41 percent in the years 1941 through 1955. At the Memorial Hospital the mortality for partial gastrectomy for the cure of cancer declined to 6 percent during the years 1951 through 1955, which represents a group of patients now available for estimation of the so-called five-year definitive cures. The more frequent use of extended total gastrectomy over partial or simple total removal of the stomach has brought additional risk to the patient but extended the possibilities of cure to patients otherwise deemed hopeless.

The cure rate of patients undergoing operations intended for cure was approximately 25 percent living and well without evidence of recurrence in the five-year interval after treatment. About 10 percent of these patients ultimately die of cancer after the five-year period has passed. Nevertheless a large proportion of patients who have undergone curative resection for gastric cancer may anticipate cure if they survive the five-year period.

The color charts of cancer chemotherapeutic agents compiled by Dr. David A. Karnofsky and published along with his article in the March-April, 1961 issue of *CA* are now available in booklet form.

The booklet includes the charts on neoplastic diseases responding to chemotherapy and specific agents used in cancer chemotherapy. Diagrams of the structural formulae of the antimetabolites, steroid compounds, polyfunctional alkylating agents and miscellaneous drugs have been included.

Copies are available from the Divisions of the American Cancer Society.

"A mass in the lung should be managed like a mass in the breast. The direct approach must be recommended because it is quick, sure, and safe. Procrastination with a coin lesion is an unfair gamble. It is the patient, not the doctor, who plays this game of Russian roulette with three bullets in the six-shooter."

WHO: **Dr. Richard H. Overholt,** Clinical Professor of Surgery, Tufts College, Medford, Massachusetts.

WHERE: "The Guess and the Gamble." In: *Surg., Gynec. & Obst.* 112:750, June, 1961.

"If someone invented a drug that would cure half the present cases of cancer, the excitement would be beyond belief. We have such a drug—and I am completely serious: it is communication."

WHO: **Dr. Leona Baumgartner,** Commissioner of the New York City Department of Health.

WHERE: Waldorf-Astoria Hotel, New York, N. Y. March 14, 1961. Speech on Health Communications. National Health Forum Conference.

"The key to all advances in medical research, service and education is personnel and there are many opportunities open to foundations, governmental agencies at all levels, industry and individuals for helping in this essential feature of American medicine. The future health needs of the country will not be met by mass education or the vocational training of large numbers of inadequately educated doctors. They will be met by the intensive preparation of leaders in the clinical and basic sciences, teaching, research and practice which emphasizes high excellence and competence. It will be they who will broaden the base and concepts of medicine in a modern society."

WHO: **Dr. Willard C. Rappleye,** President, Josiah Macy, Jr. Foundation, and Emeritus Dean of Columbia University Medical School.

WHERE: "Some Problems Ahead." Josiah Macy, Jr. Foundation—Five Year Review, 1956-1960; p. 65.

CANCER AROUND THE WORLD

Cancer Educational Surveys in Canada

What the public has learned about cancer through educational programs was studied by the Canadian Cancer Society by surveys conducted first in 1954 and recently in 1960. The following tables are a compilation of some of the data obtained from questioning women by personal interviews throughout Canada.

"Can cancer be cured or not?"

	1954	1960
Usually or sometimes	63%	71%
Never	30	27
Don't know	7	2

"Do you think early treatment increases the chance of a cure or doesn't it make any difference?"

	1954	1960
Cancer	80%	87%
Heart trouble	84	88
Tuberculosis	98	99
Asthma	61	68
Rheumatism	66	68

"What is the first sign of cancer of the breast?"

	1954	1960
Lump	77%	87%
Other signs	15	22
Don't know	12	6

"What is the first sign of cancer of the womb?"

	1954	1960
Bleeding or discharge	68%	66%
Pain	12	7
Other	15	15
Don't know	20	24

"Do you think there is anything you can do to prevent yourself from getting cancer?"

	1954	1960
Frequent check-up	17%	26%
Early diagnosis of any trouble	2	4
Cut down smoking	3	5
All others	20	12
Don't know or can do nothing	65	58

"Do you remember any of the danger signals which the Cancer Society suggests may mean that cancer is present?"

	Percentage
A lump or thickening of the breast or elsewhere	77
Unusual bleeding or discharge	65
A sore that does not heal	32
Persistent hoarseness or cough	29
Persistent changes in bowel or bladder habits	25
Persistent indigestion or difficulty in swallowing	20
Changes in a wart or mole	20
Could not recall any	15

"What are the most important sources of your information about cancer?"

	Percentage
Television	53
Newspapers	35
Pamphlets	27
Experience with the disease	24
Conversation	23
Radio	16
Discussions	14
Magazines	10
Meetings	7

While only a small proportion of the statistical material is presented here, areas of strength and weakness in the public's cancer knowledge are apparent. The curability of cancer is widely known as is the value of early treatment. On the other hand, preventive measures are not as well known or accepted.

Worthy of note is the impact of television. It was by far the most important source of cancer information. It has been suggested that television, by bringing the image of the teacher directly to the student in the home, closely approaches the person to person techniques of education and persuasion which are generally believed to be most effective.

Reaching the public with lifesaving facts about cancer requires intensive efforts and great skill. Studies such as this provide priceless guide lines toward this end.